NON-PUBLIC?: N
ACCESSION #: 9004260223
LICENSEE EVENT REPORT (LER)

FACILITY NAME: VERMONT YANKEE NUCLEAR POWER STATION PAGE: 1 OF 05

DOCKET NUMBER: 05000271

TITLE: Reactor Scram Due to Pressure Control System Failure and Primary Containment Isolation System Actuation
EVENT DATE: 03/21/90 LER #: 90-004-00 REPORT DATE: 04/20/90

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: N POWER LEVEL: 25

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: JAMES P. PELLETIER, PLANT MANAGER TELEPHONE: (802) 257-7711

COMPONENT FAILURE DESCRIPTION:
CAUSE: SYSTEM: COMPONENT: MANUFACTURER:
REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On 03/21/90 at 2248, with reactor at approximately 25% power, while bringing the TUrbine (EIIS=TA) up to speed in preparation for placing generator in service, a SCRAM occurred due to exceeding the reactor high pressure set point. The SCRAM was followed by a Primary Containment Isolation System (PCIS, EIIS=JE) Group I Isolation at 2250. The SCRAM and the isolation were the result of a failure of the Pressure Control System (EIIS=JI) to control reactor pressure. Based on results of followup testing, the root cause appears to be a lack of response of the #1 Turbine Control Valve at low hydraulic oil pressure. The root cause of the Group I isolation was the failure of the #1 Bypass Valve to go completely closed.

The immediate corrective actions were to increase the differential pressure across the Control Valve actuator and lubricate the linkage for

all the Bypass Valves. Upon initiating these immediate corrective actions the turbine-generator was successfully brought back on line.

END OF ABSTRACT

DESCRIPTION OF EVENT

At 2248 on 03/21/90, with the reactor at approximately 25% power while bringing the Turbine up to speed in preparation for placing the generator in service, a SCRAM occurred due to exceeding the reactor high pressure setpoint. The SCRAM was followed by a Primary Containment Isolation System Group I Isolation.

At the time of the event, Operations was attempting to bring the Main Turbine up to speed and place the Main Generator on-line. To accelerate the Turbine, the operator raised the Load Limiter. This action sent a signal to the Turbine Control Valves to stroke open and sent a proportionate signal to the Turbine Bypass Valves to close. The Pressure Control System adjusts both the Turbine Control and Bypass Valves to keep steam flow and pressure constant. The operator continued rising the Load Limiter, but the Turbine Control Valves remained shut due to a mechanical/hydraulic problem. The operator continued his actions until the Electrical Pressure Regulator (EPR) stroke limit was reached (this is equivalent to approximately 105% of flow). When the stroke limit was reached in conjunction with the continued operator action, the bypass valves continued to close. Since the EPR had reached its limit, the Bypass Valves were prevented from automatically re-opening to control reactor pressure and pressure increased to the high SCRAM setpoint. At approximately 2250, the reactor pressure decayed to 800psi with the mode switch in the RUN position which caused a Group I Isolation. The pressure decay occurred as a result of a bypass valve stuck above its seat.

At 2255, the reactor SCRAM was reset and conditions were stabilized. Level was being controlled by Feedwater Level Control System with letdown from the Reactor Water Cleanup System.

CAUSE OF EVENT

SCRAM

The cause of the SCRAM was due to exceeding the Reactor Protection System (EIIS=JC) high reactor pressure setpoint. The root cause has been determined to be a failure of the mechanical/hydraulic pressure control

system to respond as required. Turbine Control Valve #1 did not respond as required due to low differential pressure across the actuator piston. This lack of response resulted in the Electric Pressure Regulator (EPR) of the Pressure Control System being unable to properly control reactor pressure.

The EPR control logic and the Mechanical Hydraulic Control (MHC) system both assume that the Turbine Control Valves (TCVs) are correctly responding and are admitting steam to the HP turbine. The MHC system directs the Turbine Bypass Valves (TBVs) to close in response to the (assumed) stroking open Control Valves in order to maintain reactor pressure at the EPR pressure control point. This control point is established by the EPR setpoint plus the proportional pressure control signal. This signal ranges from 0 to 40psi, proportional to 0 to 100% total steam flow. The total steam flow signal input to the EPR is derived from the feedback signals received from the Bypass Valve Relay position and Control Valve Cam position.

During the acceleration of the Main T-G on 21 March 1990, the operator raised the Load Limiter, which sent a signal to the TCVs to stroke open. The TCVs were assumed to have opened by the EPR control logic and MHC system, therefore the TBVs were commanded to go closed and the EPR pressure control point was increased. Since the TCVs had not in fact opened, Reactor pressure increased. When pressure increased above the EPR pressure control point, it resulted in the creation of an error signal. The EPR output stroke increased in response to this error signal, resulting in a command to the TBVs to open since the TCVs were limited by the position established by the Control Valve Cam (CVC). At this time, CVC position was being limited by the Load Limiter under the control of the operator from the Control Room. As the operator continued to raise the Load Limit in an attempt to accelerate the Turbine to rated speed, reactor pressure continued to increase as did the EPR output stroke. When the EPR output stroke reached its limit and the operator continued to raise the Load Limit, (equivalent to 105% total steam flow), the TBVs continued to close and reactor pressure rapidly increased to the RPS SCRAM setpoint.

On 23 March 1990, further tests were conducted which confirmed that the hydraulic actuator for Control Valve No. 1 (CV1) was not responding as required by the control valve camshaft. The actuator itself forms part of a hydraulic relay, and positions the steam control valve as directed by the rotational position of its corresponding cam located on the control valve camshaft.

PCIS Group I Isolation

The Group I Isolation was a result of the #1 Bypass Valve sticking open to the 20% position. The group I Isolation occurred from the low steam pressure setpoint of 800 psig, (with the mode switch in the RUN position) being reached. The root cause of the bypass valve not closing was due to friction in the control linkage.

ANALYSIS OF EVENT

SCRAM

When the Turbine Bypass Valves closed, the Reactor Protection System operated as designed to initiate a SCRAM due to reaching the high pressure setpoint.

PCIS GROUP I ISOLATION

The PCIS Group I Isolation successfully occurred as designed and all main steam isolation valves closed. The Group I Isolation is an expected result of a low reactor pressure condition when the mode switch is in the run position.

This event did not adversely affect the safety of plant equipment or the public.

Technical Specification operability requirements were satisfied at all times.

All protective systems functioned as designed to protect the reactor.

CORRECTIVE ACTIONS

Immediate

1. Reset the lift setpoint of the relief valve on the return header for the Control Valve hydraulic actuators. This increased the differential pressure across the Control Valve actuators, thus increasing the pressure to open and control the valves.

2. Initiated administrative limits to prevent exceeding 40% position on the Load Limiter during acceleration to 90% of rated turbine speed. (Note: the Speed/Load Changer will take control at approximately 90

to 95% of rated turbine speed.)

3. Lubricated and tested the Turbine Bypass Valve control linkage.

Upon initiating these immediate corrective actions the Turbine-Generator was successfully brought back on line.

Subsequent

Vermont Yankee will:

1. Inspect, test and refurbish, as necessary, the #1 Turbine Control Valve, actuator and linkage during the next refueling outage.

2. Inspect, test and refurbish, as necessary, the Turbine Bypass Valve linkages during the next refueling outage.

3. Review the Preventive Maintenance Program as it applies to the Turbine Bypass Valves linkages.

4. Evaluate/revise the Operations training program to ensure that the EPR feedback signal loops are properly addressed.

5. Revise the Main Turbine-Generator operating procedure to limit the operator from exceeding 40% on the Load Limit position during turbine roll-off and during acceleration to 90% of rated turbine speed.

ADDITIONAL INFORMATION

A similar incident was reported to the Commission as LER 87-15.

VERMONT YANKEE NUCLEAR POWER CORPORATION

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April 20, 1990
VYV# 90-094

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

REFERENCE: Operating License DPR-28
Docket No. 50-271
Reportable Occurrence No. LER 90-04

Dear Sirs:

As defined by 10CFR50.73, we are reporting the attached Reportable Occurrence as LER 90-04.

Very truly yours,

VERMONT YANKEE NUCLEAR POWER CORPORATION

James P. Pelletier
Plant Manager

cc: Regional Administrator
USNRC
Region I
475 Allendale Road
King of Prussia, PA 19406

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